

## **AMENDMENTS TO THE CLAIMS**

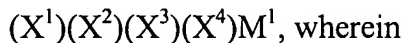
This listing of claims will replace all prior versions, and listings, of claims in the application. Please cancel Claims 1-25.

### **Listing of Claims**

Claims 1-25. (cancelled)

26. (New) A composition of matter comprising a contact product of at least one solid mixed oxide compound and at least one of: at least one organometal compound, at least one organoaluminum compound, or a combination thereof,

wherein the organometal compound has the following general formula



$M^1$  is selected from titanium, zirconium, or hafnium;

$(X^1)$  is a cyclopentadienyl, an indenyl, a fluorenyls, a substituted cyclopentadienyl, a substituted indenyl, or a substituted fluorenyl;

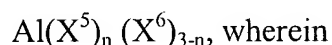
$(X^3)$  and  $(X^4)$  are independently a halide, an aliphatic group, a cyclic group, a combination of aliphatic and cyclic groups, or an organometallic group;

$(X^2)$  is a cyclopentadienyl, an indenyl, a fluorenyl, a substituted cyclopentadienyl, a substituted indenyl, a substituted fluorenyl, a halide, an aliphatic group, a cyclic group, a combinations of aliphatic and cyclic groups, or an organometallic group;

(X<sup>1</sup>) and (X<sup>2</sup>) are optionally joined by an aliphatic bridging group, a cyclic bridging group, a combination of aliphatic and cyclic bridging groups, or an organometallic bridging group; and

the substituents on the substituted cyclopentadienyls, substituted indenyls, and substituted fluorenyls, are independently an aliphatic group, a cyclic group, a combination of aliphatic and cyclic groups, an organometallic group, or hydrogen;

wherein the organoaluminum compound has the following general formula



(X<sup>5</sup>) is a hydrocarbyl having from 1-20 carbon atoms;

(X<sup>6</sup>) is a halide, hydride, or alkoxide; and

"n" is a number from 1 to 3 inclusive; and

wherein the solid mixed oxide compound comprises a mixed oxide of at least two elements of group 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15 of the periodic table, including lanthanides and actinides.

27. (New) The composition of matter of Claim 26, wherein the composition is characterized by an ethylene polymerization activity of greater than 150 gP/(gS•hr) when measured under slurry polymerization conditions, using isobutane as a diluent, at a polymerization temperature of about 90 °C, and at an ethylene pressure of about 550 psig.

28. (New) The composition of matter of Claim 26, wherein the composition is characterized by an ethylene polymerization activity of greater than 200 gP/(gS•hr) when

measured under slurry polymerization conditions, using isobutane as a diluent, at a polymerization temperature of about 90 °C, and at an ethylene pressure of about 550 psig.

29. (New) The composition of matter of Claim 26, wherein the composition is characterized by an ethylene polymerization activity of greater than 250 gP/(gS•hr) when measured under slurry polymerization conditions, using isobutane as a diluent, at a polymerization temperature of about 90 °C, and at an ethylene pressure of about 550 psig.

30. (New) The composition of matter of Claim 26, wherein the composition is characterized by an ethylene polymerization activity of greater than 300 gP/(gS•hr) when measured under slurry polymerization conditions, using isobutane as a diluent, at a polymerization temperature of about 90 °C, and at an ethylene pressure of about 550 psig.

31. (New) The composition of matter of Claim 26, wherein the organometal compound is:

bis(cyclopentadienyl)hafnium dichloride;

bis(cyclopentadienyl)zirconium dichloride;

[ethyl(indenyl)<sub>2</sub>]hafnium dichloride;

[ethyl(indenyl)<sub>2</sub>]zirconium dichloride;

[ethyl(tetrahydroindenyl)<sub>2</sub>]hafnium dichloride;

[ethyl(tetrahydroindenyl)<sub>2</sub>]zirconium dichloride;

bis(n-butylcyclopentadienyl)hafnium dichloride;

bis(n-butylcyclopentadienyl)zirconium dichloride;  
((dimethyl)(diindenyl)silane)zirconium dichloride;  
((dimethyl)(diindenyl)silane)hafnium dichloride;  
((dimethyl)(ditetrahydroindenyl)silane)zirconium dichloride;  
((dimethyl)(di(2-methyl indenyl))silane)zirconium dichloride;  
bis(fluorenyl)zirconium dichloride; or  
any combination thereof.

32. (New) The composition of matter of Claim 26, wherein the organoaluminum compound is:

trimethylaluminum;  
triethylaluminum;  
tripropylaluminum;  
diethylaluminum ethoxide;  
tributylaluminum;  
triisobutylaluminum hydride;  
triisobutylaluminum;  
diethylaluminum chloride; or  
any combination thereof.

33. (New) The composition of matter of Claim 26, wherein the solid mixed oxide compound comprises a mixed oxide of at least two of  $\text{Al}_2\text{O}_3$ ,  $\text{B}_2\text{O}_3$ ,  $\text{BeO}$ ,  $\text{Bi}_2\text{O}_3$ ,  $\text{CdO}$ ,  $\text{Co}_3\text{O}_4$ ,

$\text{Cr}_2\text{O}_3$ ,  $\text{CuO}$ ,  $\text{Fe}_2\text{O}_3$ ,  $\text{Ga}_2\text{O}_3$ ,  $\text{La}_2\text{O}_3$ ,  $\text{Mn}_2\text{O}_3$ ,  $\text{MoO}_3$ ,  $\text{NiO}$ ,  $\text{P}_2\text{O}_5$ ,  $\text{Sb}_2\text{O}_5$ ,  $\text{SiO}_2$ ,  $\text{SnO}_2$ ,  $\text{SrO}$ ,  $\text{ThO}_2$ ,  $\text{TiO}_2$ ,  $\text{V}_2\text{O}_5$ ,  $\text{WO}_3$ ,  $\text{Y}_2\text{O}_3$ ,  $\text{ZnO}$ , or  $\text{ZrO}_2$ .

34. (New) The composition of matter of Claim 26, wherein the solid mixed oxide compound comprises a mixed oxide of at least two elements from Al, B, Be, Bi, Cd, Co, Cr, Cu, Fe, Ga, La, Mn, Mo, Ni, Sb, Si, Sn, Sr, Th, Ti, V, W, P, Y, Zn, or Zr.

35. (New) The composition of matter of Claim 26, wherein the solid mixed oxide compound comprises a mixed oxide of zirconium, boron, and aluminum.

36. (New) The composition of matter of Claim 26, wherein the solid mixed oxide compound is calcined from about 300 °C to about 900 °C from about 1 minute to about 100 hours.

37. (New) The composition of matter of Claim 26, wherein the solid mixed oxide compound is calcined from about 500 °C to about 700 °C from about 1 hour to about 10 hours.

38. (New) The composition of matter of Claim 26, wherein the composition is characterized by a substantial absence of borate compounds or aluminosilicates.

39. (New) The composition of matter of Claim 26, wherein the composition is catalytically active in the presence of borate compounds or aluminoxanes.

40. (New) The composition of matter of Claim 26, wherein the composition is characterized by a substantial absence of organochromium compounds or  $\text{MgCl}_2$ .

41. (New) The composition of matter of Claim 26, wherein the composition is catalytically active in the presence of organochromium compounds or  $\text{MgCl}_2$ .

42. (New) The composition of matter of Claim 26, wherein the solid mixed oxide compound is from about 10 to about 1000 microns in size.

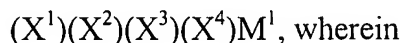
43. (New) The composition of matter of Claim 26, wherein the solid mixed oxide compound has a pore volume greater than about 0.01 cc/g.

44. (New) The composition of matter of Claim 26, wherein the solid mixed oxide compound has a surface area greater than about  $1 \text{ m}^2/\text{g}$ .

45. (New) The composition of matter of Claim 26, wherein the organometal compound comprises bis(n-butylcyclopentadienyl)zirconium dichloride, the organoaluminum compound comprises triethylaluminum, and the solid mixed oxide compound comprises a mixed oxide of zirconium, boron, and aluminum.

46. (New) A composition of matter consisting essentially of a contact product of at least one solid mixed oxide compound and at least one of: at least one organometal compound; at least one organoaluminum compound; or a combination thereof;

wherein the organometal compound has the following general formula



$M^1$  is selected from titanium, zirconium, or hafnium;

$(X^1)$  is a cyclopentadienyl, an indenyl, a fluorenyls, a substituted cyclopentadienyl, a substituted indenyl, or a substituted fluorenyl;

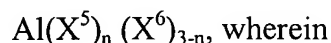
$(X^3)$  and  $(X^4)$  are independently a halide, an aliphatic group, a cyclic group, a combination of aliphatic and cyclic groups, or an organometallic group;

$(X^2)$  is a cyclopentadienyl, an indenyl, a fluorenyl, a substituted cyclopentadienyl, a substituted indenyl, a substituted fluorenyl, a halide, an aliphatic group, a cyclic group, a combinations of aliphatic and cyclic groups, or an organometallic group;

$(X^1)$  and  $(X^2)$  are optionally joined by an aliphatic bridging group, a cyclic bridging group, a combination of aliphatic and cyclic bridging groups, or an organometallic bridging group; and

the substituents on the substituted cyclopentadienyls, substituted indenyls, and substituted fluorenyls, are independently an aliphatic group, a cyclic group, a combination of aliphatic and cyclic groups, an organometallic group, or hydrogen;

wherein the organoaluminum compound has the following general formula



(X<sup>5</sup>) is a hydrocarbyl having from 1-20 carbon atoms;

(X<sup>6</sup>) is a halide, hydride, or alkoxide; and

"n" is a number from 1 to 3 inclusive; and

wherein the solid mixed oxide compound comprises a mixed oxide of at least two elements of group 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15 of the periodic table, including lanthanides and actinides.

47. (New) The composition of matter of Claim 46, wherein the solid mixed oxide compound comprises a mixed oxide of at least two of Al<sub>2</sub>O<sub>3</sub>, B<sub>2</sub>O<sub>3</sub>, BeO, Bi<sub>2</sub>O<sub>3</sub>, CdO, Co<sub>3</sub>O<sub>4</sub>, Cr<sub>2</sub>O<sub>3</sub>, CuO, Fe<sub>2</sub>O<sub>3</sub>, Ga<sub>2</sub>O<sub>3</sub>, La<sub>2</sub>O<sub>3</sub>, Mn<sub>2</sub>O<sub>3</sub>, MoO<sub>3</sub>, NiO, P<sub>2</sub>O<sub>5</sub>, Sb<sub>2</sub>O<sub>5</sub>, SiO<sub>2</sub>, SnO<sub>2</sub>, SrO, ThO<sub>2</sub>, TiO<sub>2</sub>, V<sub>2</sub>O<sub>5</sub>, WO<sub>3</sub>, Y<sub>2</sub>O<sub>3</sub>, ZnO, or ZrO<sub>2</sub>.

48. (New) The composition of matter of Claim 46, wherein the solid mixed oxide compound comprises a mixed oxide of at least two elements from Al, B, Be, Bi, Cd, Co, Cr, Cu, Fe, Ga, La, Mn, Mo, Ni, Sb, Si, Sn, Sr, Th, Ti, V, W, P, Y, Zn, or Zr.

49. (New) The composition of matter of Claim 46, wherein the solid mixed oxide compound comprises a mixed oxide of zirconium, boron, and aluminum.